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Gene therapy using plasmid DNA encoding VEGF164 and FGF2 genes: A novel treatment of naturally occurring tendinitis and desmitis in horses

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Abstract

© 2018 Kovac, Litvin, Aliev, Zakirova, Rutland, Kiyasov and Rizvanov. This clinical study describes the intralesional application of the plasmid DNA encoding two therapeutic species-specific growth factors: vascular endothelial growth factor (VEGF164) and fibroblast growth factor 2 (FGF2) in seven horses to restore naturally occurring injuries of the superficial digital flexor tendon (SDFT) (tendinitis) and in three horses with suspensory ligament branch desmitis. Following application all horses were able to commence a more rapid exercise program in comparison to standardized exercise programs. Clinical observation and ultrasonic imaging was used to evaluate the regeneration rate of the tendon and ligament injury recovery and to confirm the safety of this gene therapy in horses, throughout a 12 month period. Follow-up data of the horses revealed a positive outcome including significant ultrasonographic and clinical improvements in 8 out of 10 horses with SDFT and suspensory ligament branch lesions, with return to their pre-injury level of performance by 2-6 months after the completion of treatment. The ninth horse initially presenting with severe suspensory ligament branch desmopathy, showed no significant ultrasonographic improvements in the first 2 months after treatment, however, it improved clinically and became less lame. The final horse, presenting with severe tendinitis of the SDFT returned to their pre-injury level of performance, but experienced re-injury 6 months after treatment. This data is highly promising, however, further research in experimental models, with the histopathological, immunohistochemical and gene expression evaluation of the equine tendon/ligament after gene therapy application is required in order to fully understand the mechanisms of action. This treatment and the significant clinical impacts observed represents an important advancement in the field of medicine.

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Keywords

Fibroblast growth factor, Gene therapy, Horse, Superficial digital flexor tendon, Suspensory ligament, Tendon injuries, Vascular endothelial growth factor 164

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